REMARKS

The present amendment is in response to the Office Action dated 15 April 2010. Applicant has amended claims 1, 6, and 10. Claims 1, 6, and 10 have been amended to correct antecedent basis. Claim 10 has been amended to correct dependency. No new matter has been added.

OBJECTIONS UNDER 1.83(a)

The drawings were objected to for failing to show every feature of the invention specified in the claims. In particular, the Office Action lists certain claim limitations that must be shown or cancelled. Applicant respectfully submits that the drawings satisfy the requirements of the rule. In particular, Applicant respectfully submits that, where required, the limitations identified in the Office Action are shown in the drawings. Indeed, the drawings show "a disk allocation mechanism" (for example, disk allocation table 104, col. 16, lines 1-7), "a memory management mechanism" (for example, Demand Paging and Memory Management Facility (DPMM) 106 - col. 16 line 25 - col. 18 line 19,), "a designated logical unit" (for example, Logical Unit (LUN) 100a - col. 14 line 58 - col. 15 line 8), "a first copy" (for example, DB 96A in Disk Drive 16Da - col. 14 line 58 - col. 15 line 8), "a first storage address" (for example, DBs 96 - col. 14 lines 38-57), "an assigned storage address" (for example, DBs 96 - col. 14 lines 38-57), "a second copy" (for example, DB 96A in Disk Drive 16Db - col. 14 line 58 - col. 15 line 8), "a second storage address" (for example, DBs 96 - col. 14 lines 38-57). The Office Action also objects to the drawings for failing to show "asserting and de-asserting a parity inhibit command." O.A. p. 6. However, the cited language corresponds to method claims. Applicant respectfully submits that for method claims, it is not necessarily required to show each step in the drawings. See M.P.E.P. § 608.02. For at least these reasons, Applicant respectfully submits that the drawings comply with rule 1.83(a). Applicant respectfully requests that the objection be withdrawn.

CLAIM OBJECTIONS

Claims 1, 6, and 10 were objected to because of certain informalities. In particular, claim 1 and 6 were objected to because of lack of antecedent basis in certain limitations. Claim 10 was objected to because of its dependency. Applicant has amended claims 1 and 6 to correct the antecedent basis of the limitations identified by the Examiner. Claim 10 has also been amended to correct dependency. Applicant asserts that the amendment does not alter the scope of claims 1, 6 and 10.

With respect to claims 1 and 6, the Office Action also alleges that certain limitations are unclear. Applicant discusses the limitations identified by the Examiner below with respect to rejections under section 103. For at least these reasons, Applicant respectfully requests that the Examiner withdraw the objections to the claims.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103

Claims 1, 2, 4, 6, 7, and 9

Claims 1, 2, 4, 6, 7, and 9 were rejected as being unpatentable over Applicant's Admitted Prior Art in view of InfoWorld, March 25,1996 v18 n13n p42(1), Rathunde US Patent No. 5574,851, or Jacobson et al. (Jacobson) US Patent No. 5,546,558 and further in view of Mourad, US Patent No. 5,678,061, Stallmo US Patent No. 5,519,844, or The RAIDBook, Edition 1-1, The RAID Advisory Board, November 18, 1983, entire pages. In order to render a claim unpatentable, the cited references must teach, alone or in combination, each limitation of the claim. M.P.E.P. § 2143. For at least the reasons below, Applicant respectfully submits that the cited references fail to teach, alone or in combination, each limitation of the claims.

Claim 1
Claim 1, as amended, recites, *inter alia*:

> ... storing an identification of at least one of the logical units to be mirrored, and
> a memory management mechanism ... responsive to the identification of a designated logical unit for mirroring all data blocks written into the designated logical unit by

writing a first copy of a data block ... into ... the designated logical unit and

writing a second copy of the data block ... into a second storage address in the disk drives[.]

The specification describes several examples of storage techniques. One particular example is described at col. 14, line 58 – col. 15, line 8, reproduced below:

[E]ach Data Block (DB) 96 that meets the criteria for intra-mirroring protection, that is, is to be stored in a Logical Unit (LUN) 100 designated for intra-mirroring, such as Logical Unit (LUN) 100a in the present example, is written into two locations in Disk Drives 16D wherein the two locations are skewed with respect to one another such that each location resides on a different one of Disk Drives 16D. In the present embodiment of intra-mirroring, for example, the first or original copy of a Data Block (DB) 96 will be written into a Disk Drive 16Dn and the second or duplicate copy will be written into the next sequential Disk Drive 16Dn+1. This process is illustrated in FIG. 7B wherein Data Blocks (DBs) 96A through 96C are to be stored in Logical Unit (LUN) 100a and it is shown that Data Block 96A is written into Disk Drive 16Da and duplicated in Disk Drive 16Db, Data Block 96B is written into Disk Drive 16Db and duplicated in Disk Drive 16Dc, Data Block 96C is written into Disk Drive 16Dc and duplicated in Disk Drive 16Da, and so on.

As described in the quoted passage, in this example, data blocks that meet a certain criteria are written to two different locations. This is also illustrated in FIG. 7B, illustrated below.

FIG.7B
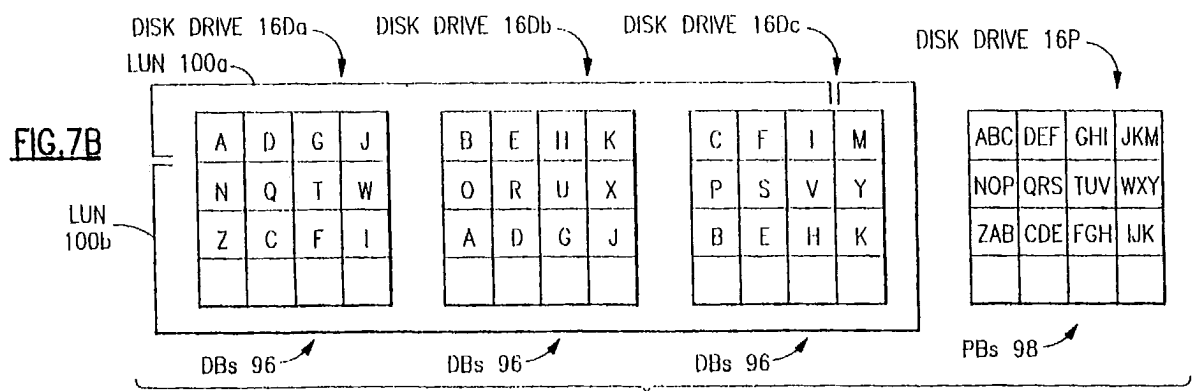
As shown, the three disk drives 16Da-c, are broken into two separate logical groups: LUN 100a and LUN 100b. The information represented by letters A-K has been written to LUN 100a and been mirrored to LUN 100b. In contrast, the information represented by letters M-Z has only been written to LUN 100b. No mirroring has been done for this information. In this example, the criteria for mirroring is the identity of the logical unit to which the first copy of the information is being written. If the first copy is written to LUN 100a, it is mirrored. If the first copy is written to LUN 100b, the data is not mirrored.

This conditional, selective mirroring with a disk array is advantageous. As described by the specification:

It is apparent, therefore, that the intra-mirroring of the present invention provides the degree of protection from data loss that is provided by conventional mirroring, but for data that is identified and selected by the user as critical and for which additional protection is desirable, and without an unacceptable increase in data storage requirements.

In view of this explanation, Applicant respectfully submits that the cited references do not teach the identified limitations.

Identification of a logical unit to be mirrored

The Office Action cites InfoWorld, Rathunde, and Jacobsen as disclosing "a disk allocation mechanism for storing an identification (RAID level) of at least one of the units to be mirrored[.]" O.A. p. 10-11. Applicant respectfully submits that a RAID level does not meet the identified limitation. The specification describes logical units as logical partitions of the available storage space. Col. 14, lines 4-27. Logical units are illustrated in FIGs. 7A-B. In contrast, RAID levels refer to different methods for storing and retrieving data from disk arrays. For example, RAID 0 refers to the method of block level striping without mirroring or parity. Applicant respectfully submits that these raid levels are not identifications of logical units to be mirrored.

Responsive to the identification

The Office Action cites InfoWorld, Rathunde, and Jacobsen as disclosing "the memory management mechanism being responsive to the identification of a unit for mirroring all data clocks written into the designated unit." O.A. p. 10-11. However, as discussed above, the references are cited as teaching responsiveness to RAID levels, not logical unit identifiers.

The Office Action separately discusses the Mourad, Stallmo, and RAID book references. These references are alleged to disclose writing a first copy of a data block to a first logical unit and writing a second copy of a data block to another disk. O.A. p. 12-13. However, claim 1 recites that the module performs the writing "responsive to the identification of a designated logical unit for mirroring." The cited portions of the references do not to meet this limitation. Mourad discloses that all stored data is mirrored. For example, Mourad states that "[w]hen a 'primary' copy of the content of the data has been so stored, then a backup copy is made such that the contents of each such primary storage area is striped across the backup storage area of the other disks." Col. 1, lines 44-59." In the portions cited by the Examiner there is no discussion of mirroring responsive to logical unit identification. Further, the cited portions of the Stallmo and RAID book references disclose the same type of RAID based functionality described above with respect to InfoWorld, Rathunde, and Jacobsen. Applicant respectfully submits that the Office Action has not identified any teaching in these references that meets the identified limitations of Claim 1. For at least these reasons, Applicant respectfully submits that the rejection be withdrawn.

Claims 2, 4, 6, 7, and 9

Applicant respectfully submits that the arguments with respect to claim 1 are also applicable to independent claim 6 and dependent claims 2, 4, 7 and 9. Applicant respectfully requests that the rejections of the claims be withdrawn for at least the same reasons.

Claims 3, 5, 8, and 10

Claims 3, 5, 8, and 10 were rejected as being unpatentable over Applicant's Admitted Prior Art (AAPA) col. 1-2 in view of in view of Mourad, US Patent No. 5,678,061, Stallmo US Patent No. 5,519,844, or The RAIDBook, Edition 1-1, The RAID Advisory Board, November 18, 1983, entire pages and further in view of InfoWorld, March 25, 1996 v18 n13n p42(1) or Murai US Patent No 5,033,050.

Claim 3

Claim 3, as amended, recites that:

> the memory management mechanism is responsive to de-assertion of the parity inhibit command for determining which data blocks have been written into the disk drives without corresponding parity blocks written into a disk drive,
> reading the data blocks written into the disk drives without corresponding parity blocks and all associated data blocks having a corresponding parity block corresponding to each of the data blocks written into the disk drives without corresponding parity blocks, and
> generating and writing into a disk drive at least one parity block corresponding to each of the data blocks written into the disk drives without corresponding parity blocks. logical unit identifiers.

The specification describes several examples of storage techniques. One advantageous example is described at col. 18, lines 27-35, reproduced below:

> [T]he mass storage system of the present invention further includes a parity mechanism which allows parity information to be generated and stored "off-line", that is, after the data has been received rather than while the data is being received, thereby significantly reducing the time required to receive and store data in circumstances wherein the time available to receive and store data is a critical factor or limitation in use of the mass storage system.

As described, responsive to a parity inhibit command, the system stops generating parity information. The omitted parity information is then recreated and written to the disks at a later time.

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The Office Action cites InfoWorld and Murai as teaching delayed parity construction. Applicant respectfully disagrees. InfoWorld discloses migration between RAID levels. However, there is no indication that migration between RAID levels includes delayed parity construction. Similarly, the Office Action does not cite any material from Murai relating to delayed parity construction. For at least these reasons, Applicant respectfully submits that Claim 3 is allowable over the cited references.

Claims 5, 8, and 10

Applicant respectfully submits that the arguments with respect to claim 3 are also applicable to independent claim 8 and dependent claims 5 and 10. Applicant respectfully requests that the rejections of the claims be withdrawn for at least the same reasons.

CONCLUSION

For all the foregoing reasons, early allowance of the pending claims respectfully requested. If the Examiner believes that a telephone conversation may be useful in advancing prosecution, the Examiner is invited to contact the undersigned at the number listed below. If necessary, applicant requests to extend the period for filing this reply pursuant to 37 CFR § 1.136(a) and authorizes the Director to charge any additional fee(s) or any underpayment of fee(s) or credit any overpayment(s) to Procopio Deposit Account No. 50-2075.

Respectfully submitted,

Dated: 10-13-10   By: _____

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